

HAVE DUAL HIGH-SIDE JACKS WITH CODED INSULATORS, RED FOR A-C INPUT, BLACK FOR D-C INPUT. THE A-C INPUT POINT INSERTS A BLOCKING CAPACITOR BETWEEN THE SOURCE AND THE D-C INPUT JACK, PROVIDING A 6DB/OCTAVE LOW FREQUENCY ROLL-OFF BELOW APPROXIMATELY 0.1 CPS. THE SINGLE OUTPUT CONNECTOR PAIR IS ALWAYS DIRECT-COUPLED TO THE UNIT OUTPUT AMPLIFIER. ALTHOUGH THIS ARRANGEMENT ELIMINATES SPURIOUS PHASE SHIFT AND OTHER PROBLEMS ASSOCIATED WITH AN OUTPUT BLOCKING CAPACITOR, IT DOES NECESSITATE PROVISION OF A D-C OFFSET ADJUSTMENT IN HIGH PASS AS WELL AS LOW PASS MODE. WHEN LOAD IMPEDANCE AND/OR FREQUENCY-OF-INTEREST IS HIGH, IT MAY BE DESIRABLE TO CONNECT HIGH PASS OR BAND PASS LOADS TO THE SECTION OUTPUT THROUGH A SUITABLE BLOCKING CAPACITOR. IN THIS CIRCUMSTANCE THE HIGH PASS D-C BALANCE ADJUSTMENT MAY BE NEGLECTED. IT IS NOT NECESSARY TO MATCH LOADS TO THE INPUT AND OUTPUT CONNECTIONS AS IN THE CASE OF PASSIVE FILTERS, IN WHICH ADVERSE EFFECTS UPON THE TRANSFER CHARACTERISTIC MAY RESULT FROM MISMATCH. ALTHOUGH THE HIGH INPUT IMPEDANCE OF THE UNIT LH FILTER PERMITS BRIDGING CONNECTION TO MOST SOURCES, ANY SOURCE MAY BE MATCHED BY CONNECTING A RESISTOR OF THE PROPER VALUE (I.E. EQUAL TO THE SOURCE CHARACTERISTIC IMPEDANCE), ACROSS THE FILTER INPUT TERMINALS. WHILE THE VIRTUAL OUTPUT IMPEDANCE SEEN BY A LOAD IS OF THE ORDER OF 150 OHMS, LOADING OF SUCH LOW VALUE WILL SEVERELY LIMIT MAXIMUM OUTPUT LEVEL ATTAINABLE. FULL RATED PEAK-TO-PEAK VOLTAGE MAY BE OBTAINED INTO A RESISTIVE LOAD OF 7000 OHMS OR MORE. REDUCTION OF THIS LOAD VALUE WILL REDUCE THE MAXIMUM VOLTAGE HANDLING CAPACITY IN DIRECT PROPORTION. WHEN FEEDING THE INPUT OF ONE SECTION FROM THE OUTPUT OF THE OTHER, A SIMPLE INTERCONNECTION OF THE TERMINALS IS RECOMMENDED.

OPERATING CONTROLS:

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TIVELY, THE MODE SELECTOR, THE RANGE SELECTOR (OR MULTIPLIER), THE MAIN TUNING DIAL AND THE TWO D-C BALANCE CONTROLS. THE LOCATION AND FUNCTION OF EACH OF THESE CONTROLS IS AS FOLLOWS:

- THE MODE SELECTOR IS A TWO POSITION KNOB DIRECTLY ABOVE THE INPUT TERMINALS; IT DETERMINES THE UNIT FILTER CHARACTERISTIC AS LOW PASS (LP), OR HIGH PASS (HP);

- THE RANGE SELECTOR, A BAR KNOB DIRECTLY BENEATH THE MAIN TUNING DIAL, SELECTS A FACTOR BY WHICH THE DIAL READING IS MULTIPLIED TO READ ACTUAL CUTOFF FREQUENCY SETTING;

- THE MAIN TUNING DIAL IS CALIBRATED OVER A FREQUENCY DECADE WITH SLIGHT OVERLAP. THE DIAL MAY BE TURNED CONTINUOUSLY IN ONE DIRECTION FOR CONVENIENCE. THE TRANSITION REGION, OCCUPYING A FEW DEGREES OF ROTATION IN THE UNCALIBRATED AREA, SHOULD BE AVOIDED, HOWEVER;

- THE LOW PASS D-C BALANCE CONTROL IS A SMALL, BLACK KNOB LOCATED DIRECTLY ABOVE THE OUTPUT TERMINALS, WHILE THE HIGH PASS D-C BALANCE CONTROL IS LOCATED DIRECTLY ABOVE THE FORMER. THESE CONTROLS OPERATE INDEPENDENTLY OF EACH OTHER AND ARE USED IN THE CORRESPONDING OPERATING MODES TO ZERO THE D-C OFFSET; THESE ADJUSTMENTS SHOULD BE MADE ONLY WHEN THE SET HAS BEEN OPERATING LONG ENOUGH TO APPROACH THERMAL STABILITY. LOW PASS D-C BALANCE IS BEST ADJUSTED WITH THE D-C INPUT TERMINALS SHORTED.

THE TOGGLE SWITCH AT THE PANEL UPPER RIGHT CORNER PUTS THE FILTER SET IN OPERATION WHEN THE POWER CORD IS PLUGGED INTO AN OUTLET RATED AT 105-125 VOLTS, 50-60 CYCLES A-C. BEFORE CONNECTING A PROPOSED LOAD TO THE FILTER, IT IS ADVISABLE TO DETERMINE WHETHER IT MAY BE OVERLOADED BY THE TRANSIENT SURGES WHICH MAY OCCUR IN TYPE LH UNITS IMMEDIATELY FOLLOWING POWER TURN-ON. THESE TRANSIENTS MAY EQUAL THE FULL SIGNAL HANDLING CAPACITY OF THE FILTER AND MAY BE LIMITED EASILY TO THE VALUE SAFE FOR ANY SENSITIVE LOAD BY SHUNTING THE FILTER OUTPUT WITH A DOU-

BLE ANODE ZENER DIODE OF SUITABLE VOLTAGE RATING. IT MUST BE REMEMBERED, OF COURSE, THAT THE DESIRED SIGNAL, AS WELL AS THE TRANSIENT, WILL BE CLIPPED SHOULD IT EXCEED THE PROTECTIVE LEVEL.

BAND PASS OPERATION IS MOST CONVENIENTLY SET UP BY CONNECTING A JUMPER WIRE FROM THE HIGH-SIDE OUTPUT TERMINAL OF THE LEFT-HAND FILTER SECTION TO THE HIGH-SIDE D-C INPUT TERMINAL OF THE RIGHT-HAND FILTER SECTION.

(NOTE: LOW-SIDE TERMINALS ARE ALL COMMON, HENCE NO EXTERNAL JUMPER IS NEEDED.) CONNECT THE SIGNAL SOURCE TO THE LEFT-HAND SECTION INPUT; TAKE OUTPUT FROM THE RIGHT-HAND SECTION OUTPUT TERMINALS. SET THE LEFT-HAND MODE SWITCH TO "HP" AND THE RIGHT-HAND MODE SWITCH TO "LP". SELECT DESIRED HIGH AND LOW CUTOFF LIMITS USING THE TUNING DIALS AND RANGE MULTIPLIERS, REMEMBERING THAT THE LOW LIMIT WILL BE DETERMINED BY THE LEFT-HAND SECTION AND THE HIGH END LIMIT BY THE RIGHT-HAND SECTION.

EXTRA-STEEP HIGH PASS OR LOW PASS OPERATION FOLLOWS FROM THE ABOVE CASCADED CONNECTION WITH BOTH MODE SELECTORS IN EITHER LP OR HP SIMULTANEOUSLY. BAND REJECT OPERATION REQUIRES PARALLELING OF THE TWO UNIT FILTERS AT THEIR INPUT TERMINALS. A SIX DECIBEL LOSS IN OUTPUT MUST BE TOLERATED IN THIS MODE DUE TO THE NEED FOR FEEDING THE MIXING POINT THROUGH ISOLATING RESISTORS TO PREVENT MUTUAL LOADING OF THE TWO OUTPUT AMPLIFIERS. IN PRACTICE, TWO EQUAL RESISTORS ARE CONNECTED TO THE RESPECTIVE SECTION OUTPUT TERMINALS AND JOINED AT A COMMON POINT, AT WHICH BAND-REJECT OUTPUT IS TAKEN. THE VALUE OF RESISTANCE SELECTED IS A COMPROMISE BETWEEN EFFECTIVE OUTPUT SOURCE IMPEDANCE AND MAXIMUM OUTPUT SIGNAL OUTPUT. IF NULL OPERATION IS DESIRED IN BAND REJECT MODE, A POTENTIOMETER SHOULD REPLACE THE TWO RESISTORS, WITH END CONNECTIONS TO THE UNIT FILTER OUTPUTS AND ARM CONNECTION TO LOAD. BY CAREFUL ADJUSTMENT OF CUTOFF DIALS (FOR PHASE) AND OUTPUT MIXING POTENTIOMETER (FOR AMPLITUDE), A NULL BALANCE OF NARROW BANDWIDTH MAY BE OBTAINED AT A SPECIFIC FREQUENCY.

VACUUM TUBE COMPLEMENT

ALL TUBES EMPLOYED IN TYPE LH ANALOG FILTERS IN CRITICAL POSITIONS ARE OF MISSILE OR PREMIUM GRADE. THEY HAVE BEEN SELECTED IN PREFERENCE TO RECEIVING TYPES BECAUSE OF SUPERIOR, INSTRUMENT GRADE CHARACTERISTICS. ALL ARE READILY AVAILABLE FROM LOCAL DISTRIBUTORS OF INDUSTRIAL OR MILITARY TUBES. ALL ARE TYPES AVAILABLE WITH JAN DESIGNATION. BEFORE INSTALLATION IN NEW EQUIPMENT IT IS OUR PRACTICE TO OPERATE ALL TUBES FOR A MINIMUM OF 150 HOURS IN AGING RACKS. A LISTING OF TYPES USED AND OF KNOWN MANUFACTURERS FOLLOWS BELOW.

<u>TYPE</u>	<u>DESCRIPTION</u>	<u>MANUFACTURER</u>
6021	SUB-MINIATURE TWIN TRIODE	RCA; GE; SYL.
5840	SUB-MINIATURE PENTODE	RCA; GE; SYL.
6922	PREMIUM TWIN TRIODE	AMP; PHIL; CBS
6BH6	MINIATURE PENTODE	RCA; GE
0A2	GAS-FILLED MINIATURE REGULATOR	RCA; GE
0C3/VR105	GAS-FILLED OCTAL-BASED REGULATOR	RCA; GE
0G3/85A2	GAS-FILLED MINIATURE VOLTAGE REF.	AMP; PHIL; TS
6AS7GA	TWIN TRIODE POWER REGULATOR	GE

MFG. KEY: (1) RCA = RADIO CORP. OF AMERICA; (2) GE = GENERAL ELECTRIC CO.; (3) AMP = AMPEREX ELECTRONICS CORP.; (4) PHIL = PHILLIPS EINDOVEN (HOLLAND); (5) TS = TUNG-SOL ELECTRONICS; CBS LABORATORIES, INC., HYTRON DIVISION.

FUSES, Etc.

TYPE LH FILTER POWER SUPPLY SECTIONS ARE FUSED AT ALL CRITICAL POINTS. THESE INCLUDE (1) POWER LINE INPUT FUSED WITH TWO 3 AMP. TYPE 3AG FUSES IN BLOCKS NEAR THE INPUT CORD TERMINATION; (2) D-C HEATER AND (3) MAIN ANODE SUPPLY, FUSED WITH INDIVIDUAL 1 AMPERE TYPE 3AG FUSES ON THE RECTIFIER BOARD. FURTHER SURGE PROTECTION IS PROVIDED THE SILICON RECTIFIERS BY USE OF FULL WAVE BRIDGE CONNECTION RATHER THAN CENTER-TAPPED FULLWAVE. ALL RECTIFIER DIODES ARE 1N2070 OR

EQUAL. SERIES CONNECTED DIODES IN THE ANODE SUPPLY RECTIFIER LEGS ARE FURTHER PROTECTED BY 5.6 MEGOHM EQUALIZING RESISTORS SHUNTING EACH DIODE.

HEATER SUPPLY CIRCUIT

TO MINIMIZE D-C OFFSET IN THE OUTPUTS DUE TO CHANGES OF POWER LINE VOLTAGE THE HEATERS OF ALL FILTER SECTION TUBES AND CRITICAL ANODE SUPPLY REGULATOR TUBES ARE PROVIDED WITH REGULATED D-C POWER. A RESISTOR-CAPACITOR FILTER FOLLOWING THE BRIDGE RECTIFIER OF THIS SUPPLY REDUCES HUM CONTRIBUTION BY THESE HEATERS TO A VERY LOW LEVEL. ACTUAL REGULATION IS PRODUCED BY THE SHUNT OC3 AND THE SERIES 3H20B TUBES, THE FORMER BEING A CONSTANT VOLTAGE GAS TUBE AND THE LATTER A CONSTANT CURRENT BALLAST TUBE OF THE HOT-IRON-FILAMENT VARIETY. THE 3H20B IS PROTECTED FROM EXCESSIVE VOLTAGE DROP DURING THE SURGE, OR COLD HEATER, PHASE BY A VOLTAGE SENSING RELAY CONTROLLING THE A-C INPUT TO THE RECTIFIER. THE OC3 IS SAVED FROM DAMAGING EXCESS SHUNT CURRENT BY A CONTINUITY SENSING RELAY WHICH DISCONNECTS IT FROM THE SHUNT LOAD WHEN THE HEATER PATH THROUGH ANY TUBE IS OPENED. THIS RELAY ALSO LOCKS THE FORMER RELAY AT THE LOW A-C TAP AND PROHIBITS ITS SECONDARY FUNCTION OF TURNING ON ANODE CURRENT WHEN A TUBE HAS AN OPEN CIRCUITED HEATER OR IS REMOVED FROM ITS SOCKET. UNDER NO CIRCUMSTANCES SHOULD A BALLAST TUBE OF DIFFERNT TYPE NUMBER BE SUBSTITUTED FOR THE 3H20B. SIMILARLY, NO SIMILAR OCTAL-BASED GAS TUBE OF DIFFERING VOLTAGE RATING CAN BE EFFECTIVELY SUBSTITUTED FOR THE OC3.

IF DIFFICULTIES ARE ENCOUNTERED IN SERVICE WHICH CANNOT BE RECTIFIED BY MEANS SUGGESTED ABOVE, CONTACT THE MANUFACTURER WITH ALL AVAILABLE INFORMATION FOR SPECIFIC ADVICE AS TO PROCEDURE. ADDRESS CORRESPONDENCE TO: SPECTRUM INSTRUMENTS, INC., P.O. Box 474 TUCKAHOE, N.Y., U.S.A., OR TELEPHONE 914-SP9-8111.

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TUBES AND SEMICONDUCTOR COMPONENTS ARE GUARANTEED BY THEIR SEVERAL MANUFACTURERS ARE EXCLUDED FROM THE WARRANTY.

IF UNSATISFACTORY OPERATION CANNOT BE RECTIFIED BY TUBE OR SEMICONDUCTOR REPLACEMENT, OR IF THE DIFFICULTY IS NOT REVEALED BY ON-THE-SPOT INSPECTION OR NON-DESTRUCTIVE TESTS, YOU ARE ADVISED TO CONTACT US. IF FROM THE INFORMATION SUPPLIED WE ARE UNABLE TO INSTRUCT AN IN-HOUSE REPAIR, WE WILL AUTHORIZE RETURN TO OUR SHOP FOR NECESSARY REPAIRS AND/OR ADJUSTMENTS. RETURNS MADE WITHOUT OUR PREVIOUS AUTHORIZATION WILL NOT BE ACCEPTED FROM THE CARRIER. SHIPPING OR OTHER COSTS INCIDENTAL TO AUTHORIZED RETURNS AND SUBSEQUENT REFORWARDING TO THE OWNER WILL ORDINARILY BE BORNE BY SAID OWNER OF THE EQUIPMENT, EXCEPT DURING THE FIRST SIX MONTHS FOLLOWING ORIGINAL DELIVERY. RESPONSIBILITY FOR INSURING RETURNED EQUIPMENT DURING THE PERIOD WHEN SUCH EQUIPMENT IS OUT OF THE OWNER'S POSSESSION SHALL AT ALL TIMES REST WITH SAID OWNER FOR ALL RISK OF LOSS OR DAMAGE.

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